UNITED STATES PATENT AND TRADEMARK OFFICE

NOTICE OF ALLOWANCE AND FEE(S) DUE

21171   7590   09/18/2008

STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER
BROOME, SAID A

ART UNIT	PAPER NUMBER
2628	

DATE MAILED: 09/18/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,235	12/31/2003	Jerome Maillot	1500.1079	7111

TITLE OF INVENTION: ACCELERATED RAY-OBJECT INTERSECTION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	12/18/2008

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u>

Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or <u>Fax</u> **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

21171   7590   09/18/2008

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)

_____ (Signature)

_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,235	12/31/2003	Jerome Maillot	1500.1079	7111

TITLE OF INVENTION: ACCELERATED RAY-OBJECT INTERSECTION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	12/18/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
BROOME, SAID A	2628	345-420000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❏ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❏ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE   (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) :   ❏ Individual ❏ Corporation or other private group entity ❏ Government

4a. The following fee(s) are submitted:

❏ Issue Fee

❏ Publication Fee (No small entity discount permitted)

❏ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

❏ A check is enclosed.

❏ Payment by credit card. Form PTO-2038 is attached.

❏ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

❏ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❏ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____   Date _____

Typed or printed name _____   Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.   OMB 0651-0033   U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,235	12/31/2003	Jerome Maillot	1500.1079	7111

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21171	7590	09/18/2008	BROOME, SAID A

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2628	

DATE MAILED: 09/18/2008

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 269 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 269 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

	Application No.	Applicant(s)
Notice of Allowability	10/748,235	MAILLOT, JEROME
	Examiner	Art Unit	
	SAID BROOME	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to <u>amendment filed 8/14/08</u>.

2. ☒ The allowed claim(s) is/are <u>11-20, 22, 24-26, 31, 34 and 35</u>.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a) ☐ All   b) ☐ Some*   c) ☐ None   of the:
        1. ☐ Certified copies of the priority documents have been received.
        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the
            International Bureau (PCT Rule 17.2(a)).
    * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of
        Paper No./Mail Date _____.
    Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)
1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
    Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
    Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Response to Amendment

1. This office action is in response to an amendment filed on 8/14/2008.

2. Claims 1-10, 21, 23, 27-30, 32, 33 and 36 have been cancelled.

3. Claims 11-20, 22, 24-26, 31, 34 and 35 are original.

Allowable Subject Matter

Claims 11-20, 22, 24-26, 31, 34 and 35 are allowed. The following is an examiner's

statement of reasons for allowance:

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for*

Animation"), do not teach the limitations of claims 11-17. In regards to claim 11, Yamrom

teaches a method of using a volatile or non-volatile computer readable media or storage unit

finding an intersection with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an

intersection with the surface of an original mesh surface (Fig. 2) and also teaches determining an

intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5). However, none of

the prior art teaches or suggests storing a data structure for an original mesh surface that is

provided with a bounding surface bounding the mesh surface and is provided with a tight inner

surface, the data structure comprising a first tessellation linking the tight inner surface to the

original mesh surface, and a second tessellation linking the bounding surface to the tight inner

surface, and using the data structure to at least one of find an intersection with the original mesh

surface, determine whether an intersection with the original mesh surface is occluded by the

original mesh surface; and to identify an order of an intersection, therefore claims 11-17 are

allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for*

Animation"), do not teach the limitations of claim 18. Yamrom teaches finding an intersection

with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the

surface of a three dimensional object (Fig. 2) and also teaches determining an intersection by

using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by

the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests a method

of automatically finding an intersection with an original mesh surface, the method comprising

finding an intersection with the original mesh surface by using an outer bounding surface, a tight

inner surface that is both bounded by the outer bounding surface and wraps the original mesh

surface and a tessellation between the inner bounding surface and the outer bounding surface,

and one of displaying the intersection on a display and storing the intersection in a storage,

therefore claim 18 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for*

Animation"), do not teach the limitations of claim 19. Yamrom teaches finding an intersection

with an original mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with

the surface of a three dimensional object (Fig. 2) and also teaches determining an intersection by

using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by

the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests finding an

intersection with the original mesh surface by using an outer bounding surface, a tight inner

surface that is both bounded by the outer bounding surface and wraps the original mesh surface

and a tessellation between the inner bounding surface and the outer bounding surface, wherein

the finding of the intersection with the original mesh surface is performed according to an

intersection with the outer bounding surface, and one of displaying the intersection on a display

and storing the intersection in a storage, therefore claim 19 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for*

Animation"), do not teach the limitations of claim 20. Yamrom teaches finding an intersection

with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the

surface of a three dimensional object (Fig. 2), and also teaches determining an intersection by

using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), with a surface that is bounded by

the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests finding of

the intersection with the original mesh surface is performed according to an intersection with the

outer bounding surface, and wherein the tight inner surface comprises a convex hull, wherein

there is a first tessellation between and linking the convex hull with the outer bounding surface,

and wherein the finding further comprises traversing a path form the intersection with the outer

bounding surface through the second tessellation to an intersection with the convex hull surface,

and traversing from the intersection with the convex hull surface through the first tessellation to

thereby find the intersection with the original mesh surface, and one of displaying the

intersection on a display and storing the intersection in a storage, therefore claim 20 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for*

Animation"), do not teach the limitations of claim 22. Yamrom teaches finding an intersection

with a mesh object (col. 1 lines 46-48). Glassner illustrates finding an intersection with the

surface of a three dimensional object (Fig. 2), and also teaches determining an intersection by

using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), with a surface that is bounded by

the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests finding an

intersection with the original mesh surface by using an outer bounding surface and a tight inner

surface that is both bounded by the outer bounding surface and wraps the original mesh surface,

wherein the finding of the intersection with the original mesh surface is performed according to

an intersection with the outer bounding surface, and wherein the tight inner surface comprises a

convex hull, wherein there is a first tessellation between and linking the convex hull with the

original mesh surface, wherein there is a second tessellation between and linking the convex hull

with the outer bounding surface, and wherein the finding further comprises traversing a path

from the intersection with the outer bounding surface through the second tessellation to an

intersection with the convex hull surface, and traversing from the intersection with the convex

hull surface through the first tessellation to thereby find the intersection with the original mesh

surface, wherein the path corresponds to polygons or polyhedrons of the tessellations that

intersect with a line that also defines the intersection with the bounding surface and also defines

the intersection with the original mesh surface, and one of displaying the intersection on a

display and storing the intersection in a storage, therefore claim 22 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for

Animation*"), do not teach the limitations of claim 24. Yamrom teaches finding an intersection

with a mesh object (col. 1 lines 46-48), Glassner illustrates finding an intersection with the

surface of a three dimensional object (Fig. 2), and teaches determining an intersection by using

an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), where a surface that is bounded by the

outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests determining

whether an intersection between a line and a mesh model is, relative to the mesh model, an outermost intersection between the line and the mesh model, the method comprising determining whether a polyhedron or polygon intersected by the line one of contains and is an outermost intersection with the line based on whether such polyhedron or polygon is on a convex hull surface of the mesh model using a tessellation linking the mesh model and the convex hull, and one of displaying the intersection on a display and storing the intersection in a storage, therefore claim 24 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 25. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48), Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2), and teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), where a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests determining whether an intersection between a line and a mesh model is, relative to the mesh model, an outermost intersection between the line and the mesh model, the method comprising determining whether a polyhedron or polygon intersected by the line one of contains and is an outermost intersection with the line based on whether such polyhedron or polygon is on a convex hull surface of the mesh model using a tessellation linking the mesh model and the convex hull, further comprising identifying the polyhedron or polygon by traversing polyhedrons or polygons that intersect the line, and one of displaying the intersection on a display and storing the intersection in a storage, therefore claim 25 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 26. Yamrom teaches finding an intersection with a mesh object (col. 1 lines 46-48), and Glassner illustrates finding an intersection with the surface of a three dimensional object (Fig. 2), and teaches determining an intersection by using an outer bounding surface (pg. 61 2nd col. 4th ¶ lines 1-5), with a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests determining whether an intersection between a line and a mesh model is, relative to the mesh model, an outermost intersection between the line and the mesh model, the method comprising determining whether a polyhedron or polygon intersected by the line one of contains and is an outermost intersection with the line based on whether such polyhedron or polygon is on a convex hull surface of the mesh model using a tessellation linking the mesh model and the convex hull, further comprising traversing to a next polyhedron or polygon when a traversed polyhedron or polygon is inside an interior or convex region of the mesh model, and one of displaying the intersection on a display and storing the intersection in a storage, therefore claim 26 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 31. Yamrom teaches finding an intersection of a ray with an original mesh surface (col. 1 lines 46-48). Glassner teaches determining an intersection by using an outer bounding surface of a mesh object (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). However, none of the prior art teaches or suggests detecting movements of the ray or the object, one relative to the other, and for some of the movements, when the ray intersects the mesh object at a local neighbor of a face of the mesh object, determining whether intersection of the ray with the mesh object is

occluded by the mesh object by traversing polygons not part of the mesh object, and when the

ray does not intersect the mesh object at a local neighbor of a face of the mesh object, finding an

intersection of the ray with the mesh object by traversing polygons intersected by the ray, where

the polygons are not part of the mesh object and include at least one polygon of a bounding

surface bounding the mesh object, and one of displaying the moved intersection on a display and

storing the moved intersection in a storage, therefore claim 31 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for

Animation*"), do not teach the limitations of claim 34. Yamrom teaches finding an intersection

with an original mesh surface between a ray and the mesh surface (col. 1 lines 46-48). Glassner

teaches finding an intersection with the surface of a three-dimensional object, as illustrated in

(Fig. 2), and also teaches determining an intersection by using an outer bounding surface on (pg.

61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3).

Glassner also teaches traversing adjacent intersected polygons or polyhedrons, (Fig. 3), starting

from a first intersection until an intersection is found (pg. 61 lft col. 6th ¶ lines 2-6 – rgt. col. 1st ¶

lines 1-2). However, none of the prior art teaches or suggests a storage unit storing: an original

mesh surface that is provided with a bounding surface bounding the mesh surface, a convex hull

surface of the original mesh surface, a first tessellation linking the convex hull to the original

mesh surface, and a second tessellation linking the bounding surface to the convex hull, where

the second tessellation tessellates a space between the bounding surface and the convex hull

surface, and where the first tessellation tessellates a space between the convex hull surface and

the original surface mesh, and a processing unit performing at least one of finding a first

intersection between a ray and the original mesh by finding a first intersected polygon or

polyhedron of the bounding surface, and then traversing adjacent intersected polygons or polyhedrons starting from the first intersection until the intersection is found, and finding a second intersection between the ray and the original mesh when the ray or original mesh have relatively moved, finding a polygon locally neighboring the first intersection and containing a first intersection with the moved ray, and traversing out from the neighbor polygon through adjacent polygons or polyhedrons intersected by the moved ray, and determining whether traversed polygons or polygons of traversed polyhedrons are unoccluded along ray based on whether they are part of the convex hull surface, therefore claim 34 is allowable.

The prior art, Yamrom (US Patent 6,249,287) and Glassner ("*Spacetime Ray Tracing for Animation*"), do not teach the limitations of claim 35. Yamrom teaches finding an intersection with an original mesh surface between a ray and the mesh surface (col. 1 lines 46-48). Glassner teaches finding an intersection with the surface of a three-dimensional object, as illustrated in (Fig. 2), and also teaches determining an intersection by using an outer bounding surface on (pg. 61 2nd col. 4th ¶ lines 1-5), and a surface that is bounded by the outer bounding surface (Fig. 3). Glassner also teaches traversing adjacent intersected polygons or polyhedrons, (Fig. 3), starting from a first intersection until an intersection is found (pg. 61 lft col. 6th ¶ lines 2-6 – rgt. col. 1st ¶ lines 1-2). However, none of the prior art teaches or suggests a method of automatically finding an intersection with an original mesh surface, the method comprising finding an intersection with the original mesh surface by using an outer bounding surface, using a tight inner surface that is both bounded by the outer bounding surface and wraps the original mesh surface and using details of an intersection with the outer bounding surface, and one of displaying the intersection on a display and storing the intersection in a storage, therefore claim 35 is allowable.

Any comments considered necessary by applicant must be submitted no later than the

payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for

Allowance."

Response to Arguments

Applicant's arguments, see amendment, filed 8/14/08, with respect to claims 1-10, 23,

27-30, 32, 33 and 36 have been fully considered and are persuasive. The rejection of claims 1-10,

32 and 33 under 35 U.S.C. 112 first paragraph and claims 23, 27-30 and 36 under 35 U.S.C.

102(b) has been withdrawn, due to the cancellation of claims 1-10, 23, 27-30, 32, 33 and 36.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to SAID BROOME whose telephone number is (571)272-2931.

The examiner can normally be reached on M-F 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Said Broome/
Examiner, Art Unit 2628

/Jin-Cheng Wang/

Primary Examiner, Art Unit 2628